SOV/124-58-5-4992

How to Construct a Transient (cont.)

transfer function of a closed system. The author neglects to explain the fact that the formula in question, which interrelates the discrete values for input and output values, though essentially precise, nevertheless requires that the poles of the closed system's transfer function be ascertained. An approximate formula is obtained by replacing the exact discrete transfer function with a function comprising the transfer coefficients of the system's individual components. This formula does not require the solving of the closed system's characteristic equation. Simplified examples are given of the use of this procedure for the approximate determination of transient functions. An account is given of several modifications of the procedure which adapt it for use with nondirectional circuits and for determining approximately a discrete transfer function through a substitution for the independent parameter. The article contains references to works published previously on this subject.

A.A. Krasovskiy

1. Control systems--Mathematical analysis

Card 2/2

SOV/124-58-3-2621

Translation from: Referativnyy zhurnal, Mekhanika, 1958, Nr 3, p 12 (USSR)

AUTHOR: Tsypkin, Ya. Z.

TITLE: On the Relationship Between the Spectra of an Amplitude-modulated Impulse Sequence and of Its Envelope (O svyazi mezhdu spektrami amplitudno-modulirovannoy posledovatel'nosti impul'sov i yeye ogibayushchey)

PERIODICAL: Tr. Vses. zaochn. energ. in-ta, 1957, Nr 7, pp 107-114

ABSTRACT: The author designates with f*(t) a modulated sequence of impulses following one another at intervals of time T_o with a repetition frequency of $\omega_o = 2\pi/T_o$ and with f (t) - their envelope with which f* (t) coincides at discrete moments of time $t = nT_o$. If $F(j\omega)$ is the spectrum of f(t) and on the basis of physical considerations the spectrum of f* (t) is determined as

$$F^*(j\omega) = \sum_{n=0}^{\infty} e^{-j\omega n T_o} f(nT_o)$$

then the relationship between the spectrum of the amplitude-modulated sequence of impulses and the spectrum of its

Card 1/2

SOV/124-58-3-2621

On the Relationship Between the Spectra (cont.)

envelope appears as

$$F^{*}(j\omega) = \frac{\omega_0}{2\pi} \sum_{m=-\infty}^{\infty} F\ [j(\omega - m\omega_0)]$$

The expression of the reaction of the circuit under the action of the envelope is examined with the help of the reaction of the circuit under the action of a unit-area impulse and it is stated that the transmission of an uninterrupted signal may be replaced by a transmission of a modulated sequence of impulses with a repetition frequency of ω_0. In a particular case where the circuit is an ideal filter with a cut-off frequency of $\omega_c = \omega_0/2$, the expression f (t) is obtained by means of its discrete values for $t = nT_0$.

V. S.Lyukshin

Card 2/2

TSYPKIN, YA. Z.

105-8-20/20

AUTHOR TSYPKIN, Ya.Z., Dr.techn.sc.Prof., PETROV, I.I., cand. tecn. sc.,dotsent

TITLE Book Review: M.V. Meyerov "Introduction to the Dynamics of the Automatic Control of Electric Machines" (Bibliografiya: M.V. Meyerov. Vvedeniye v dinamiku avtomaticheskogo regulirovaniya elektricheskikh mashin. Russian)

PERIODICAL Elektrichestvo, 1957, Nr 8, pp 94 - 96(U.S.S.R.)

ABSTRACT Published by "Akademizdat", 1956, 416 pages, price 22 roubles. The book deals with: the theory of transition processes in electrical machines, the description of standardized elements and the general theory of automatic control. The treatise consists of an introduction and 17 chapters. In chapter 1 the equations for the electric machines are derived, in chapter 2 the standardized elements of the control-system are described. Chapter gives the principles of the Fourier' and Laplace transformation theory. Chapters 4 - 12 deal with the theory of normal linear continuous systems and chapter 13 deals with the theory of impulse-systems. The last 4 chapters describe methods and problems of the non-linear control-theory.

Card 1/2

105-8-20/20

Book Review: M.V. Meyerov "Introduction to the Dynamics of the Automatic Control of Electric Machines"

ASSOCIATION Professorial Chair for Automatic Control and Regulation VZEI, Professorial Chair for Electrification of Industrial Enterprises VZEI
(Kafedra avtomaticheskogo kontrolya i regulirovaniya VZEI. - Kafedra elektrifikatsii prompredpriyatiy VZEI)

PRESENTED BY
SUBMITTED
AVAILABLE Library of Congress

Card 2/2

TSYPKIN, Ya. Z.

CARD 1 / 2 PA - 1995

SUBJECT USSR / PHYSICS
AUTHOR LETOV,A.M., NAUMOV,B.N., RACEEV,V.A., CYPKIN,JA.Z.
TITLE The Congress on Automatic Control Held at Heidelberg (German Federal Republic).
PERIODICAL Avtomatika i telemechanika 18, fasc.1, 93-96 (1957)
Issued: 2 / 1957

This congress took place from the 25.9.1956 to the 29.9.1956 at Heidelberg and was organized by the department for control technics (president Dr.Grebe) of the Society of German Electrotechnic/Engineering (VDE/VDI). The congress was attended by scientists of international repute. Most of the participants, practicians and theoreticians came from Western Germany. The USSR was represented by a delegation of the Institute for Automatics and Telemechanics of the Academy of Science in the USSR under the leadership of A.M.LETOV. The Soviet delegation had the following instructions: a) to take part in the congress, b) to establish contact with foreign scientists taking part in the congress as well as with technical engineering circles, c) to visit several firms. Soviet cooperation in the congress consisted in: a) lectures held by Soviet delegates, answering as well as asking questions in the course of discussions, b) participation in discussions concerning lectures delivered by delegates of other countries.
Organisation and work performed by the congress are both described as being good. The texts of the total of about 70 original lectures were submitted to the organizing committee already before the congress was opened; they were

printed 6 - 8 weeks in advance and were sent to all participants. This made it possible to study all details closely up to the control of computations and calculations, which made discussions particularly interesting. After the congress was opened plenary lectures were delivered: The following 11 departments were organized: 1.) Technical means of automatics, 2.) reciprocally coupled control, 3.) linear methods in the theory of control, 4.) the automatized factory, 5.) determination of nonlinear processes by means of frequency methods, 6.) nonlinear and interrupted control systems, 7.) the control of boilers, 8.) optimum tuning and quality of control, 9.) control in industry, 10.) statistical methods of control, 1.) computers (counting machines) in control technics. Among others the following problems were discussed: The application of nonlinear elements and computing devices on control systems, the use of counting machines (?) for the computation of automatic systems, the determination of the dynamic characteristics of objects from the data obtained on the basis of normal work. The themes of some works are mentioned.

The following aims were formulated for the organization of an International Federation of Specialists on Automatic Control: 1.) Exchange of information concerning the automatic control among individual member states, 2.) Organization of international congresses on automatic control every four years.

A committee which was charged with the task of preparing the organization of this federation was formed.

INSTITUTION:

TSYPKIN, YA. Z.

"Correction of Control and Regulation Pulse Systems," by Ya. Z. Tsypkin, Avtomatika i Telemekhanika, Vol 18, No 2, Feb 57, pp 111-125

Continuous methods and pulse methods are considered in the paper for correction of pulse systems. A technique for calculation of the correction elements is described, and the author shows the possibility of employing digital computers as correction elements. (U)

SUM. 1322

TSYPKIN, YA. Z. ,16(0); 28(2) PHASE I BOOK EXPLOITATION SOV/3565

Akademiya nauk Azerbaydzhanskoy SSR

Tezisy dokladov Soveshchaniya po vychislitel'noy matematike i primeneniyu sredstv vychislitel'noy tekhniki (Outlines of Reports of the Conference on Computational Mathematics and the Use of Computer Techniques) Baku, 1958. 63 p. 400 copies printed.

Additional Sponsoring Agencies: Akademiya nauk SSSR. Vychislitel'nyy tsentr, and Akademiya nauk SSSR. Institut avtomatiki i telemekhaniki.

No contributors mentioned.

PURPOSE: This book is intended for pure and applied mathematicians, scientists, engineers and scientific workers, whose work involves computation and the use of digital and analog electronic computers.

COVERAGE: This book contains summaries of reports made at the Conference on Computational Mathematics and the Application of Computer Techniques. The book is divided into two main parts. The first part is devoted to computational mathematics and contains 19 summaries of reports. The second section is devoted to computing techniques and contains 20 summaries of reports. No personalities are mentioned. No references are given.

AVAILABLE: Library of Congress (QA75.B7)

AC/fal
4-13-60

Card 7/7

7(7); 9(8) PHASE I BOOK EXPLOITATION SOV/2086

Tsypkin, Yakov Zalmanovich

Teoriya impul'snykh sistem (Theory of Pulse Systems) Moscow, Fizmatgiz, 1958. 724 p. 15,000 copies printed.

Eds.: N.A. Korolev and I.V. Pyshkin; Tech. Ed.: S.S. Gavrilov.

PURPOSE: This book is intended for scientists and engineers concerned with the design and calculation of pulse systems.

COVERAGE: Despite the great variety of pulse systems and the many fields of their application in contemporary technique, the author has aimed at presenting the theory and methods of calculating such systems in a simplified form. He employs, wherever possible, methods used in calculating conventional continuous linear systems, using the Laplace transform as the main mathematical tool. This has enabled him to introduce for pulse systems the concepts of transfer function, frequency response and time characteristics and to clearly determine transient and steady-state processses. Chief attention

Card 1/8

is paid to the method of investigation and to an explanation of the characteristics of pulse systems. The book is illustrated by a great number of examples and detailed solutions of typical problems accompanied by formulas and graphs. The author drew partly on the material contained in his previous book "Transient and Steady-state Processes in Pulse Circuits", (Gosenergoizdat, 1951). The author considers necessary the publication of another book which would complete the coverage of pulse systems, in particular, problems concerning the approximate analysis and synthesis of continuous systems with constant, variable and nonlinear parameters, and also the application of the theory of pulse systems for solving a number of problems of numerical analysis. He thanks V.I. Gokov, N.A. Korolev, I.S. Morosanov, I.V. Pyshkin and M.M. Simkin for their help in editing the text. There are 354 references divided into 4 groups: 1. Circuit diagrams and application of pulse systems - 56 references, of which 27 are English, (1 translated into Russian), 7 German, 1 Czech and 21 Soviet. 2. Discrete Laplace transforms and difference equations - 58 references, of which 34 are English (6 translated into Russian), 15 Soviet, 5 German (2 translated into Russian), 2 Polish, 1 French and 1 Czech. 3. Open-cycle pulse systems - 63 references, of which 30 are Soviet, 26 English (1 translated into Russian), 3 Polish, 2 German and 2 Czech. 4. Closed-cycle pulse systems - 177 references, of which 108 are English (5 translated into Russian), 50 Soviet, 12 German (2 translated into Russian), 3 Czech and 2 Polish.

TABLE OF CONTENTS:

SOV/2086

AVAILABLE: Library of Congress

JP/jmr
8-27-59

Card 8/8

TSYPKIN, Ya.Z.

Some problems in the synthesis of dampled-data control systems [with summaries in Russian and English]. Avtomatyka, no.1:3-19 '58. (MIRA 11:4)

1. Institut avtomatiki i telemekhaniki AN SRSR.
(Automatic control)

TSYPKIN, YA. Z.

SOV/144-58-9-18/18

AUTHOR: Gikis, A. F., Candidate of Technical Sciences, Docent

TITLE: Inter-University Scientific Conference on Electric Measuring Instruments and Technical Means of Automation (Mezhvuzovskaya nauchnaya konferentsiya po elektroizmeritel'nym priboram i tekhnicheskim sredstvam avtomatiki)

PERIODICAL: Izvestiya Vysshikh Uchebnykh Zavedeniy, Elektromekhanika, 1958, Nr 9, pp 130-135 (USSR)

ABSTRACT: The conference was held at the Leningradskiy elektrotekhnicheskiy institut imeni V. I. Ul'yanova (Lenina) (Leningrad Electro-technical Institute imeni V. I. Ul'yanov (Lenin)) on November 11-15, 1958. The representatives of eleven higher teaching establishments and three research institutes participated and a large number of specialists of various industrial undertakings were present.

Professor Ye. G. Shramkov and Junior Scientific Worker S. A. Spektor (Leningrad Polytechnical Institute imeni M. I. Kalinin) presented the paper "Measurement

Card 8/13

of large d.c. currents by the method of nuclear magnetic resonance", which permits measuring with an error below 0.1%; the built experimental instrument was suitable for measuring currents up to 35 000 A with an error not exceeding 0.05%.

Professor N. N. Shumilovskiy (Moscow Lenin Order Power Institute) presented the paper "Basic trends of development of radio-active methods of automatic control of production processes"; he dealt with sources of metering errors and methods of improving the accuracy.

Professor Ya. Z. Tsypkin (Institute of Automatics and Telemechanics, Ac.Sc. USSR) presented the paper "On certain features and potentialities of impulse automatic systems". He dealt particularly with "compensation" delay in impulse automatic systems, impulse extremal and self-setting systems and basic trends in the development of impulse circuits.

Card 9/13

103-19-5-1/14

AUTHOR: Tsypkin, Ya. Z. (Moscow)

TITLE: Sampled-Data Systems With Extrapolating Devices (Impul'snyye avtomaticheskiye sistemy s ekstrapoliruyushchimi ustroystvami)

PERIODICAL: Avtomatika i Telemekhanika, 1958, Vol. 19, Nr. 5, pp. 389-400 (USSR)

ABSTRACT: The article contains a section of the lecture on "Some Problems of the Theory of Discreet Systems" held on the symposium in Atlantic City, USA, in October 1957. Sampled-data systems in which the extrapolating device (ED), i. e. the transformer of the discreet data into continuous ones, is one of the elements of the system are described here. As the investigated extrapolation is closely connected with the knowledge of the nature of the process within a repetition period, i. e. between the discreet moments, the equation of the system with an extrapolating device must express the process at any moment. At first the structure and then the equation of the extrapolating device are given. From equation (5) is to be seen that the

Card 1/2

Sampled-Data Systems With Extrapolating Devices 103-19-5-1/14

forming elements must contain the lag elements, the amplifiers and integrators. It is shown that the ED consists of 2 parts: a discreet one (discreet filter) and a continuous one (integrators) (Reference 2). The equation for the closed sampled-data system with an extrapolating device is derived. Equation (12) contains the equations of sampled-data systems with a fixator (References 3 and 5) as well as the equations of the system for the transformation of discreet data into continuous ones (Reference 2) as special cases. The different forms for the representation of the transmission function of an open system are given. The processes in closed systems with ED are determined. From formula (24) derived here the impulse characteristic of the closed sampled-data system can be determined. Finally an example of the computation of a system with ED is given. There are 12 figures, 3 tables and 11 references, 6 of which are Soviet.

SUBMITTED: September 12, 1957

AVAILABLE: Library of Congress

Card 2/2

1. Mathematical computers--Theory

Tsypkin Ya. Z.

28(1) SOV/30-59-1-48/57

AUTHOR: Meroeanev, I. S.

TITLE: Development of the Theory and the Application of Discreet Automatic Systems (Razvitiye teorii i primeneniy diskretnykh avtomaticheskikh sistem)

PERIODICAL: Vestnik Akademii nauk SSSR, 1959, Nr 1, pp 138-139 (USSR)

ABSTRACT: The conference dealing with this problem took place in Moscow from September 22 to 26, 1958 and was opened by V. A. Trapeznikov, chairman of the Natsional'nyy komitet SSSR po avtomaticheskomu upravleniyu (National Committee of the USSR for Automatic Control). In the Plenary Meeting Ya. Z. Tsypkin reported on discreet automatic systems and their development prospects. The work of the conference was undertaken by 5 sections. Reports were held by:).
G. P. Tartakovskiy and V. P. Perov reported on new investigation results in the case of pulse systems with variable parameters.
Fan Ch'ung-wei dealt in his report with his successful procedures of analysis of pulse systems with several elements.
F. M. Kilin spoke about the problem of an increase of the perturbation stability of the systems.

Card 1/3

Ya. I. Sapkin investigated the possibilities of pulse systems.
A. A. Krasovskiy investigated one of the possible ways of constructing an automatic control system with a discreet correcting device.
E. A. Kregius analysed pulse systems.
A. V. Pyshkin investigated the conditions of eigen oscillations (avtokolebaniye) in a system with wide range pulse modulation.
Yu. V. Dolgolenko reported on the method of determining parameters of a boundary cycle for an extreme system.
V. V. Kazakevich dealt with the results of approximation calculation methods of extreme systems.
A. A. Fel'dbaum investigated the influence of perturbations.
A. G. Butkovskiy and S. N. Domanitskiy reported on the construction of optimum control systems for objects with retardation.
G. K. Nakhafova investigated methods of determining the maximum [illegible] effect of control systems.
G. G. Varshavskiy spoke about the construction of an automatic machine for objects with retardation which permits the best possible control systems.

Card 2/3

M. A. Gavrilov analysed modern telemechanical equipment from the viewpoint of the so-called "finite automatic machines" (consisting of systems of a finite number of elements).
P. P. Parkhomenko reported on the effect and construction of a special logical machine for the analysis of relay orders.
Yu. Ya. Bazilevskiy investigated accurate "finite automatic machines" which in the case of an unvariable structure furnish arbitrary items of several arguments.
G. K. Berends and A. A. Tal' reported on a pneumatic system of elements of "finite automatic machines" with the logical elements described as "not", "and", "or" by means of which further logical functions can be put into practice.
The participants in the conference considered the technical working out of the papers presented to them insufficient. In the last session the heads of the committees summarized the results obtained at the conference and briefly mentioned the important tasks in further developing the theory and the application of discreet automatic systems.

Card 3/3

18

3(2) SOV/20-124-4-23/67

AUTHOR: Tsypkin, Ya. Z.

TITLE: On the Elimination of the Influence of Retardation on the Dynamics of Nonlinear Automatic Pulse-systems (Ob ustranenii vliyaniya zapazdyvaniya na dinamiku nelineynykh impul'snykh avtomaticheskikh sistem)

PERIODICAL: Doklady Akademii nauk SSSR, 1959, Vol 124, Nr 4, pp 812-814 (USSR)

ABSTRACT: A nonlinear pulse-system is composed of a nonlinear element (which transforms the error x into the quantity $x_1 = \Phi(x)$), a pulse-element (which transforms the quantity x_1 into a sequence of rectangular pulses which are modulated with respect to amplitude, width, or position) and of a continuous part containing the retarding element. Retardation shifts the instances of time of action to the constant time τ, often deteriorates the dynamic properties of the system, and may lead to instability. The characteristic features of the mode of action of pulse-systems render it possible to compensate this unfavorable influence of retardation and to realize (in nonlinear pulse-systems) processes which differ from the

Card 1/3

SOV/20-124-4-23/67

On the Elimination of the Influence of Retardation on the Dynamics of Nonlinear Automatic Pulse-systems

processes in similar systems without retardation only by a shifting of time. The author investigates the processes in the relative time scale $\bar{t} = t/T_p$, where T_p is the interval of repetition. Further, it is assumed for reasons of simplification that the relative retardation $\bar{\tau} = \tau/T_p = m_1$ is an integer. Formulas for the uninterrupted reaction $\Psi(r,x[k])$ of the continuous part of the system are written down. By summation of the reaction of the continuous part over individual pulses it is possible to determine an equation for the processes in the pulse-system at discrete points of time. In order to be able to eliminate the influence produced by retardation, it is necessary that the controlling signal satisfy a condition given by the author. Also the equation of the extrapolating device is explicitly written down. Moreover, the structure of the extrapolating device does not depend on the nat of nonlinearity or of the type of modulation. The structural scheme of the nonlinear pulse-system in which the influence exercised by retardation on the dynamic properties of the processes is eliminated, is shown

Card 2/3

SOV/20-124-4-23/67

On the Elimination of the Influence of Retardation on the Dynamics of Nonlinear Automatic Pulse-systems

in form of a schematic drawing. A discrete filter actually modulates the processes in the object to be regulated. There are 3 figures and 1 Soviet reference.

ASSOCIATION: Institut avtomatiki i telemekhaniki Akademii nauk SSSR (Institute of Automation and Telemechanics of the Academy of Sciences, USSR)

PRESENTED: October 23, 1958, by V. A. Kotel'nikov, Academician

SUBMITTED: October 21, 1958

Card 3/3

TSYPKIN, Ya.Z., prof., doktor tekhn.nauk, otv.red.; GRIGOR'YEV, Ye.N., red.izd-va; ASTAF'YEVA, G.A., tekhn.red.

[Automatic control] Avtomaticheskoe upravlenie. Moskva, 1960. 431 p. (MIRA 13:7)

1. Akademiya nauk SSSR. Institut avtomatiki i telemekhaniki. (Automatic control)

16.6800

S/044/62/000/005/059/072
C111/C444

AUTHOR: Tsypkin, Ya. Z.

TITLE: Elements of the theory of digital automatic systems

PERIODICAL: Referativnyy zhurnal, Matematika, no. 5, 1962, 61, abstract 5V343. ((Mezhdunar. federatsiya po avtomat. upr. 1-y Mezhdunar. kongress po avtomat. upr.) M., AN SSR, 1960, 18 pages, illustrated)

TEXT: One points to the fact that the theories of scanning and Relais systems of the automatic control have reached a high level of development where against a theory of digital automatic systems is actually lacking. One describes elements of the theory of digital automatic systems under consideration of the quantizing (with respect to the level as well as to time). The function scheme of the digital automatic system and its description are given. One underlines that it is characteristic for digital automatic systems that a number of quantities accepts fixed values in fixed points of time caused by the quantizing. Equations describing the dynamic of the digital automatic systems, are given. The analysis of the digital automatic systems is considered; it consists of the estimation of the influence of the quantizing effect at given or

Card 1/4

S/044/62/000/005/059/072
C111/C444

Elements of the theory of digital ...

arbitrary effects, further of the investigation of periodic and in-stationary processes; one supposes thereby that the structure of the digital automatic system be given. The estimation of the quantizing effect consists of the determination of the variation of the initial quantity at quantizing with respect to the level; a formula giving this estimation is added. One points to the fact that in case the transition function of a linear impulse system is aperiodic (i. e. the impulse characteristic is positive), the periodic processes being possible in the digital automatic system are not large than a quantizing interval according to their amplitude (with respect to the level); the more oscillating the transition function, the larger the amplitude of the periodic processes in the digital automatic system can be. One points to the fact that in a number of cases the given estimation can be superelevated; therefore a statistic investigation by aid of the method of statistic linearisation would be interesting. One points to the fact that the quantizing with respect to the level is a non-linear operation in which processes periodic to the digital automatic systems are possible. The cause is often the saturation of the characteristic of quantizing which follows after a certain number of quantizing intervals. A method for the investigation of the periodic processes is described. Transition processes in digital automatic

Card 2/4

S/044/62/000/005/059/072
C111/C444

Elements of the theory of digital ...

systems are investigated for the case if at a lacking of periodic processes the transition process converges to a certain stationary state which is determined by the outer effect, quantized with respect to the level. The synthesis of the digital automatic systems is described; it consists of a choice of the structure of the system and of the program of the digital computor such that the processes in the system satisfy the put up technical demands. A synthesis is considered where the parasitary influence of the dead-time is compensated and where in a certain sense optimal processes are realised; thereby one understands under the elimination of the influence of the dead-time the following facts: In the system with dead-time one attains a process which distinguishes itself from the process in the system without dead-time only by a temporary displacement which is equal to the dead-time. Optimal processes in the digital automatic systems are considered; under which one understands processes which at given limitations let any quality measure become extremal. Because of the quantizing effect one uses for the solution of this problem the method of dynamic programming according to R. Bellman. The synthesis of an optimal system follows in two stages: 1. The

Card 3/4

APPROVED FOR RELEASE: 08/31/2001 CIA-RDP86-00513R001757320008-8"

S/044/62/000/005/059/072
C111/C444

Elements of the theory of digital ...

determination of the controlling which has to bear upon the cut open system in order the process be optimal; 2. The determination of the structure of the closed system where the optimal influence of the control is formed. The block circuit diagram of an optimal system is given.

There are nine figures and a bibliography with ten titles.

[Abstracter's note: Complete translation.]

Card 4/4

S/194/61/000/002/014/039
D216/D302

16,8000

AUTHOR: Tsypkin, Ya.Z.

TITLE: Discrete automatic systems - problems of theory and prospects of development

PERIODICAL: Referativnyy zhurnal. Avtomatika i radioelektronika, no. 2, 1961, 33, abstract 2 V254 (V sb. Teoriya i primeneniye diskretn. avtomat. sistem, M., AN SSSR, 1960, 5-24)

TEXT: Basic ideas and definitions are given in relation to the discrete automatic systems (DAS) with either level- or time- or both level- and time-quantization. The classification of those systems is given and basic characteristics of DAS of various types are given which relate the quantized to the corresponding continuous signals, the characteristics permitting evaluation of the effect of various quantization parameters (frequency and level) on the dynamic properties of DAS. Examples of the practical possibil-

Card 1/2

B

S/194/61/000/002/014/039
D216/D302

Discrete automatic systems...

ity of realizing DAS are given. Basic problems of theory of DAS are solved. 11 references.

Card 2/2

Tsypkin, Ya.

S/107/60/000/06/002/004
E073/E435

AUTHOR: Tsypkin, Ya., Winner of the Lenin Prize, Professor, Doctor of Technical Sciences

TITLE: Remarks Relating to the Launching of the Soviet Spaceship-Satellite on May 15, 1960

PERIODICAL: Radio, 1960, No.6, p.2

TEXT: The success of launching of the huge spaceship was made possible due to the extreme accuracy of the scientific and the design calculations. I am extremely pleased with the achievements of my colleagues, who work in the field of "space" automation. They have managed to design apparatus which ensured guiding the spaceship into orbit in accordance with the predetermined programme.

✓

Card 1/1

29754
S/194/61/000/006/024/077
D201/D302

9,3275 (1159)

AUTHOR: Tsypkin, Ya.Z.

TITLE: Compensation of the delay effect in automatic pulse-systems

PERIODICAL: Referativnyy zhurnal. Avtomatika i radioelektronika, no. 6, 1961, 38, abstract 6 V271 (V sb. Teoriya i primeneniye diskretn. avtomat. sistem., M., AN SSSR, 1960, 156-171)

TEXT: A method of compensating the effect of delay in the object on the dynamic properties of linear pulse-systems is suggested. The method makes it possible to obtain a transient response in a system with delay differing from that in a system without delay, only by the magnitude τ of this delay. To obtain such a transient response special control elements have to be introduced into the control circuit: a discrete filter (DF) connected to the output of the pulse element and a discrete extrapolator (DE) connected to the output of

Card 1/2

29754
S/194/61/000/006/024/077
D201/D302

Compensation of the delay effect...

the continuous section located behind the pulse element. The DF and DE are added together, forming in advance by time t the delay of the output of the system and this sum is used for the feedback signal. DR consists of a series of elementary memory elements, in every one of which the delay is equal to the interval of repetition T of the pulse element and the total delay is τ = mT. The output of memory elements are added to the gain equal to m by the first cadence value of the pulse transient response function. DE consists of a chain of l similar memory elements with overall feedback (l - order of the output system). The parameters of DE are determined by those of the output system. 13 references. [Abstracter's note: Complete translation]

Card 2/2

~~66044~~ 69644

28.1000

S/024/60/000/02/013/031
E140/E135

AUTHOR: Tsypkin, Ya.Z., (Moscow)

TITLE: Certain Properties and Possibilities of Pulse Control Systems 9

PERIODICAL: Izvestiya Akademii nauk SSSR, Otdeleniye tekhnicheskikh nauk, Energetika i avtomatika, 1960, Nr 2, pp 98-109 (USSR)

ABSTRACT: This paper was presented at the All-Union Conference on Electrical Measurements and Automation Instruments, November 11-15, 1958, Leningrad. The article contains an analysis and discussion of linear (amplitude-modulated) pulse control systems. In such systems a continuous input function is quantised by the pulse element and then processed by a continuous element. If the input spectrum has frequencies exceeding half the repetition rate of the pulse element, a transposition of high frequency components into the low frequency end of the spectrum takes place. This is in contrast to filtering where the high frequency components are eliminated. This is at the basis of Kotel'nikov's pulse theory. Formula (2.17) indicated that the spectral density of a random quantised signal is obtained by summation of the spectral densities

Card 1/3

APPROVED FOR RELEASE: 08/31/2001 CIA-RDP86-00513R001757320008-8"

~~66044~~ 69644

S/024/60/000/02/013/031
E140/E135

Certain Properties and Possibilities of Pulse Control Systems

shifted along the frequency axis. From Eq (2.17) it follows that the spectral density of a quantised signal cannot be lessthan the spectral density of the unquantised signal. Expression (2.20) gives the relation between the spectral densities of input and output quantities, quantised in time. It is analogous to relations applying to unquantised quantities. Concerning the dynamic properties, pulse automatic control systems may be better and have greater stability reserves than continuous control systems. This includes systems with delay and distributed parameters, for which the introduction of time quantisation leads to stabilisation. An interesting and important characteristic of pulse automatic control systems consists in the possibility of realising processes in which the error after a finite number of repetition intervals becomes identically equal to zero. These processes are analogous to those occurring in relay control systems. The realisation of such an optimal system may be carried out by varying the structure and parameters of the continuous part or by introducing a discrete filter in the error loop. Applications are

Card
2/3

~~66044~~ 69644

S/024/60/000/02/013/031
E140/E135

Certain Properties and Possibilities of Pulse Control Systems

given: stroboscopic oscillographs; optimal control systems with models operating repetitively to an accelerated time scale; control systems with zero error employing accelerated models for determining correct moment of relay operation; closed-loop control in serial production. The introduction of digital computers will substantially broaden the above perspectives.

There are 18 figures and 6 references, of which 2 are Soviet and 4 English.

Card 3/3

ASSOCIATION: Institut avtomatiki i telemekhaniki Akademii nauk SSSR (Institute of Automation and Remote Control, Academy of Sciences, USSR)

SUBMITTED: December 11, 1959

Tsypkin, Ya. Z.

13.2000

S/024/60/000/04/004/013
E140/E463 82208

AUTHOR: Tsypkin, Ya.Z. (Moscow)

TITLE: Optimal Processes in Pulse Automatic Control Systems

PERIODICAL: Izvestiya Akademii nauk SSSR, Otdeleniye tekhnicheskikh nauk, Energetika i avtomatika, 1960, No.4, pp.74-93

TEXT: Based on a paper at the meeting of the All-Union Society for Science and Technology imeni A.S.Popov, May 17, 1960.

An optimal process in a pulse automatic control system (PACS) is a process of finite duration in which some functional defining the system quality in a given defined sense takes on an extremal. The development of an optimal PACS (one in which the optimal process is realized) consists of two steps: determination of the optimal control signal producing the optimal process; determination of the structure of the optimal PACS in which the optimal control signal is generated. Various authors (Ref.1 to 6) describe the PACS by difference equations and the first part of the problem is solved by finding a trajectory in a certain phase space. However the set of first order difference equations describing behaviour of the system does not permit direct physical

Card 1/3

S/024/60/000/04/004/013
E140/E463
8 2208

Optimal Processes in Pulse Automatic Control Systems

reasoning and does not give a convenient point of departure for the second part of the problem. The author has developed a method based on the transient characteristics of the continuous part of the pulse system and employing the theory of extremals of functions of many variables and the method of dynamic programming. This requires the use of digital computers for practical solution. After discussing the solution of the first part of the problem and deriving the principal equations, the author then discusses realization, giving block diagrams of various possible system structures for the most general and certain special cases. Three examples are then given: 1) PACS with minimum control signal energy; 2) PACS with least-square error; 3) PACS in which the maximum value of the output quantity is realized at a given instant (in a minimum number of pulse periods). For nonlinear PACS, the solution of the equations can only be carried out by computers. This may be done in two ways, by first solving the problem on the computer and then designing the equipment to realize the solution, or by building a special purpose real-time computer into the system. For systems with random inputs the

Card 2/3

S/024/60/000/04/004/013
E140/E463 82208

Optimal Processes in Pulse Automatic Control Systems

mathematical expectation of the index of quality may be used as the functional to take on an extremal. There are 7 figures and 13 references: 5 Soviet and 8 English.

SUBMITTED: April 29, 1960

Card 3/3

S/194/62/000/009/030/100
D201/D308

AUTHOR: Tsypkin, Ya. Z.

TITLE: Frequency method of construction of transients in on-off control systems

PERIODICAL: Referativnyy zhurnal, Avtomatika i radioelektronika, no. 9, 1962, abstract 9-2-116 kh (Bul. Inst. politehn. Iaşi, 1960, 6, no. 1-2, 227-230 (summaries in Eng. and Rum.))

TEXT: The author describes a graphical method of constructing the pulse response function $K(\tau)$ of an on-off control system, containing continuously operating links from the real part Re $K(j\omega)$ of the frequency response. The method is based on the trapezoidal approximation of Re $K(j\omega)$ and is similar to the one used for continuously operating systems. 8 references. /Abstracter's note: Complete translation./

Card 1/1

S/030/60/000/011/008/026
B021/B059

AUTHOR: Tsypkin, Ya. Z., Doctor of Technical Sciences

TITLE: Discrete Automatic Systems

PERIODICAL: Vestnik Akademii nauk SSSR, 1960, No. 11, pp. 61-65

TEXT: Discrete automatic systems make it possible to raise the speed of transmission and evaluation of information, to increase precision of function of the elements and of the entire system, and to utilize the various methods of information storage. In discrete systems, at least one of the quantities is subjected to quantization. Discrete automatic systems may be divided into relay-, pulse-, and digital systems. Automatic relay systems are characterized by quantization of one of the quantities representing the value of parameters according to the level of the signals. They are non-linear. The properties of relay systems having one degree of freedom were thoroughly investigated according to A. A. Andronov's theory. The study of the possibilities of realizing optimum processes is a large part of the present theory of automatic control, namely the theory of optimum systems. Methods for the construction of such systems are being worked out. Automatic relay systems are employed in solving new problems, as e.g.,

Card 1/2

Discrete Automatic Systems

S/030/60/000/011/008/026
B021/B059

in radio-telemechanics and in systems of program control. Automatic pulse systems are distinguished by quantization of one of the quantities with respect to time and allow to avoid the detrimental effect of delay in controlled objects. They have a highly noiseproof feature. The theory of automatic pulse systems is at a high level at present. In automatic digital systems, quantization of one of the quantities with respect to both level and time simultaneously is realized by means of a digital computer. This digital computer can be used as device for problems, comparison, correcting, and searching. Fig. 1 shows an automatic pulse system, Fig. 2 optimization of the process by means of modelling. An allround use of automatic discrete systems without theoretical basis is not possible. The development of self-tuning automatic systems raises new problems. Related scientific fields must be inquired for solving them. There are 2 figures.

Card 2/2

TSYPKIN, Ya.Z.

In reference to A.A.Kulikovskii's article "Determining the stability of transistor and vacuum-tube circuits on the basis of the real component of the pole immitance." Elektrosviaz' 14 no.6:71 Je '60. (MIRA 13:7)
(Electronic circuits)
(Kulikovskii, A.A.)

16.9500

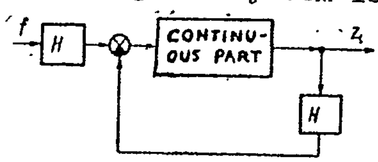
78155
SOV/103-21-3-1/21

AUTHOR: Tsypkin, Ya. Z. (Moscow)

TITLE: Appraisal of the Effect of Quantization Level on Processes in the Digital Automatic Systems

PERIODICAL: Avtomatika i telemekhanika, 1960, Vol 21, Nr 3, pp 281-285 (USSR)

ABSTRACT: A method is described of determining the interval of quantization level in automatic digital systems, the linear parts of which contain constant and variable parameters. (1) The Equivalent Diagram of the Automatic Digital System. A diagram of an automatic digital system is shown in Fig. 1:



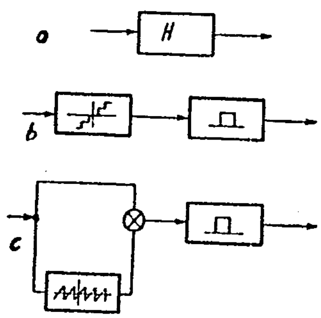
Card 1/7

Fig. 1

Appraisal of the Effect of Quantization Level on Processes in the Digital Automatic Systems

78155
SOV/103-21-3-1/21

Here, H is an element transforming a continuous quantity into a discrete quantity. This element may be replaced by a series connection of an impulse element and a relay element with several step characteristics (Fig. 2a, b).



Card 2/7

Fig. 2

Replacing further the relay element by a parallel connection of the amplifying element with a gain unity and a nonlinear element, the characteristic ψ of which is a difference between the linear and the relay characteristic (Fig. 2c), the following transformations of the system of Fig. 1 are obtained:

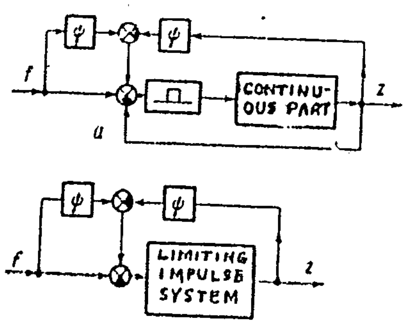


Fig. 3

Appraisal of the Effect of Quantization Level on Processes in the Digital Automatic Systems

78155
SOV/103-21-3-1/21

Let k_3 $(n,m,\mathcal{E})$ be the impulse characteristic of the linear impulse closed loop system which can also include the variable parameters. Then the equation of the system corresponding to Fig. 3b will be given in the form:

$$z[n,\varepsilon] = \sum_{m=0}^{n} k_3[n,m,\varepsilon]\{[\Psi(f[m]) - \Psi(z[m,0])] + f[m]\}. \quad (1.2)$$

(2) Deviation Caused by Level Quantization. The limiting impulse automatic system z_1 differs from the automatic digital system z in the absence of the level quantization. Difference between $z(n,\mathcal{E})$ and $z_1(n,\mathcal{E})$ determining the effect of level quantization is given in the form:

Card 4/7

Appraisal of the Effect of Quantization Level on Processes in the Digital Automatic Systems

78155
SOV/103-21-3-1/21

$$\delta z[n, \varepsilon] = z\ [n, \varepsilon] - z_i[n, \varepsilon] = \sum_{m=0}^{n} k_3[n, m, \varepsilon]\{\Psi(/[m]) - \Psi(z\ [m, 0])\}. \quad (2.4)$$

(3) Determination of Maximum Deviation. The following equations for the maximum value of $|\delta z\ [n, \varepsilon]|$ are obtained from Eq. (2.4):

$$\max|\delta z[n, \varepsilon]| \leqslant \sum_{m=0}^{n} |k_3[n-m, \varepsilon]|\sigma \quad (3.5)$$

or

$$\max|\delta z[n, \varepsilon]| \leqslant \sum_{m=0}^{n} |k_3[m, \varepsilon]|\sigma. \quad (3.6)$$

Card 5/7

where σ is interval of quantization. The maximum deviation of the process caused by level quantization does not exceed the sum of the absolute values of the impulse characteristic of the limiting impulse automatic system. (4) Comparison of Some Features of a Limiting Impulse Automatic System (Further Mentioned as I.A.S.) and an Automatic Digital System (Further Mentioned as A.D.S). For the I.A.S. and A.D.S., equations are derived for steady-state transfer characteristics. It is shown that if the impulse characteristic of I.A.S.:

$$k_5[n, n-m, \varepsilon] \geqslant 0, \tag{4.5}$$

is not negative for a given n, ε and an arbitrary m, then the maximum deviation caused by the level quantization in a given time does not exceed the product of the quantization interval of the value of the

Appraisal of the Effect of Quantization Level on Processes in the Digital Automatic Systems

78155
SOV/103-21-3-1/21

transfer function during this time. A.D.S. with constant parameters is then considered. From Eq. (4.5) the conditions of monotony are determined. When transfer function is monotonous, the deviation caused by level quantization does not exceed the quantization interval. Only in this case may the stability condition for I.A.S. be determined when basing on A.D.S. stability conditions. The method explained makes it possible to determine the maximum quantization interval for which the difference between the processes in A.D.S. and I.A.S. does not exceed a specified given quantity. There are 3 figures; and 4 references, 3 Soviet, 1 U.S. The U.S. reference is: Bertram, J. E., Effect of Quantization in Sampled Feedback Systems, Applications and Industry, Nr 38, 1958.

SUBMITTED: June 28, 1959

Card 7/7

TSYPKIN, Ya.Z., doktor tekhn.nauk

Theory serves practice. Nauka i zhizn' 27 no.10:8-12 O '60.
(MIRA 13:10)

(Cybernetics)

TSYPKIN, Ya.Z., doktor tekhn.nauk

Discrete automatic systems. Vest. AN SSSR 30 no.11:61-65 N '60. (MIRA 13:11)

(Automatic control)

TSYPKIN, Ya.Z.

Optimal processes in automatic pulse systems. Dokl.AN SSSR 134 no.2:308-310 S '60. (MIRA 13:9)

1. Institut avotmatiki i telemekhaniki Akademii nauk SSSR. Predstavleno akad. V.A. Kotel'nikovym.
(Automatic control)

TSYPKIN, YA. Z.

"Periodic solutions of nonlinear finite-difference equations and their stability."

Paper presented at the Intl. Symposium on Nonlinear Vibrations, Kiev, USSR, 9-19 Sep 61

Institute of Automatics and Telemechanics, Academy of Sciences of the USSR, Moscow

TSYPKIN, Ya.Z., doktor tekhn. nauk, prof., otv. red.toma; NOVICHKOVA, N.D., tekhn. red.

[Proceedings of the 1st International Congress of the International Federation of Automatic Control, Moscow, 1960] Trudy I Mezhdunarodnogo Kongressa Mezhdunarodnoi federatsii po avtomaticheskomu upravleniiu. Moskva, Izd-vo Akad. nauk SSSR. Vol.3. [Statistical investigation methods. Theory of structures, simulation, terminology, and education] Statisticheskie metody issledovaniia. Teoriia struktur, modelirovanie, terminologiia, obrazovanie. 1961. 744 p. (MIRA 14:8)

1. International Federation of Automatic Control, 1st International Congress, Moscow, 1960.
(Automatic control) (Electronic calculating machines)

20474
S/106/61/000/004/001/004
A055/A133

16.9500 (1031, 1121, 1132)

AUTHOR: Tsypkin, Ya. Z.

TITLE: Analysis of open-loop systems with pulse-amplitude modulation

PERIODICAL: Elektrosvyaz', no. 4, 1961, 3-8

TEXT: The open-loop system with pulse-amplitude modulation of Class I can be imagined as a series connection of the key and of the continuous circuit:

$$\frac{F^*(q)/}{F^*(q,\lambda)} \cdot \underline{X(q)} \boxed{\frac{K(q)}{K^*(q,\varepsilon-\lambda)}} \frac{Z(q)}{Z^*(q,\varepsilon)} \rightarrow .$$

(* refers to Jury - Ref. 3: "Sampled-data control systems". Willey, 1959). The key is closed periodically for a finite duration, so that the continuous circuit is subjected to the action of the train of pulses whose tops vary with the shape of the input signal (Fig. 2). In the analysis and calculation of such systems, Farmanfara and Tou (Refs. 1 and 2) introduce special transformations (P-transformation and τ-transformation) which are essentially Laplace transformations of a modulated pulsesequence (Fig. 2b). In the pre-

Card 1/3

20474
S/106/61/000/004/001/004
A055/A133

Analysis of open-loop systems with...

sent article, the author proves, by a comprehensive mathematical demonstration, that the analysis of pulse-amplitude modulation systems of Class I (or "systems with key", as they are also called) can be reduced to the analysis of the usual open-loop pulse systems (pulse-amplitude modulation systems of Class II), whose theory has been sufficiently developed by Jury (Ref. 3) and also by the author himself (Ya. Z. Tsipkin - Ref. 4: "Theory of Pulse Systems", Fizmatgiz., 1958). Based upon the Laplace transformation, the analysis in question can, indeed, be carried out in a simpler and more natural way. There are 3 figures, 1 Soviet-bloc and 3 non-Soviet-bloc references. The English-language references are: Farmanfara. Analysis of linear sampled-data systems with finite pulse width. Open loop. "Communications and Electronics", 1957, no. 28; Tou. Analysis of sampled-data control systems with finite sampling duration. "Proc. of National Electronics Conference", 1957, v. 13; Jury. "Sampled-data control systems". Willey, 1959.

SUBMITTED: September 14, 1960

Card 2/3

26769
S/103/61/022/006/004/014
D229/D304

16.8000 (1132, 1068)

AUTHOR: Tsypkin, Ya.Z (Moscow)

TITLE: On investigating the stability of periodical regimes in non-linear automatic pulse systems

PERIODICAL: Avtomatika i telemekhanika, v. 22, no. 6, 1961, 711 - 721

TEXT: The equation of stability in small deviations is deduced. It is found that the equation corresponds to a linear automatic pulse system with periodically changing amplification coefficient. Direct investigation of the latter is impossible but it can be reduced to an equivalent pulse system with constant parameters. There are two possibilities of doing this; the first one was used by I.V. Pyshkin (Ref. 6: Avtokolebaniya v sistemakh s shirotno-impul'snoy modulyatsiyey. Teoriya i primeneniye diskretnykh avtomaticheskikh sistem (Natural Oscillations in Systems with Pulse-Width Modulation. Theory and Applications of Discrete Automatic Systems)

Card 1/2

26769
S/103/61/022/006/004/014
D229/D304

On investigating the stability ...

Trudy konferentsii, Izd-vo AN SSSR, 1960). The author uses the second possibility, obtaining equations which correspond to equivalent multiple-feedback linear systems with several pulse elements, and solving them. There is stability if the roots of a characteristic equation have negative real parts. The problem of random disturbances is also reduced to that of the behavior of a linear pulse system with variable amplification coefficient or of an equivalent system with constant coefficients; formulae for the correlation function and the dispersion of deviation are deduced. There are 4 figures and 7 references; 6 Soviet-bloc and 1 non-Soviet-bloc.

SUBMITTED: December 30, 1960

Card 2/2

25710
S/020/61/139/003/009/025
B104/B201

16.8000 (1344, 1121, 1132)

AUTHOR: Tsypkin, Ya. Z.

TITLE: Effect of random noise upon the periodic operation in automatic relay systems

PERIODICAL: Akademiya nauk SSSR. Doklady, v. 139, no. 3, 1961, 570 - 573

TEXT: A study has been made of automatic relay systems consisting of a relay and a continuous part which can be connected both as concentrated and as distributed parameters (Fig. 1). Periodic conditions of operation with the frequency ω_c are assumed in this system. These periodic conditions of operation can be either imposed from outside, or the system is oscillatory. Random disturbances in the relay component or in the continuous part change the periodic operation. The author estimates the change of periodic operation as caused by random noise, i. e., he finds an expression for the mean square of this deviation. As has been previously shown by the author (Teoriya releynykh sistem avtomaticheskogo regulirovaniya (Theory of relay systems for automatic control), M., 1955, gl VIII), the equation of a relay system may be written in the form

Card 1/4

25710
S/020/61/139/003/009/025
B104/B201

Effect of random noise...

$L\{x(t)\} = L\{f(t)\} - W(p)L\{\Phi(x(t))\}$ (1). Here, f(t) is the action from outside, x(t) the error, W(p) the transfer function of the linear part, Φ the characteristic of the relay element. x(t) can, under periodic conditions, be represented by $x(t) = \tilde{x}(t) + \xi(t)$, where $\xi(t)$ denotes the deviation from periodic conditions. Then, $L\{\tilde{x}(t) + \xi(t)\} = L\{\tilde{f}(t) + \psi(t)\} - W(p)L\{\Phi(\tilde{x}(t) + \xi(t))\}$ (3) is obtained for (1). For a sufficiently small random noise, the relative deviation can be described by $L\{\xi(t)\} = L\{\psi(t)\} - W(p)L\{\Phi'(\tilde{x}(t))\xi(t)\}$ (5), where Φ' is the derivative of the relay component characteristic, for which the author, in the abovementioned previous work, had obtained

$$\Phi'(\tilde{x}(t)) = 2k_p\delta(\tilde{x}(t)) = \frac{2k_p}{|\dot{\tilde{x}}(\pi/\omega_0)|}\sum_{k=-\infty}^{\infty}\delta\left(t - k\frac{\pi}{\omega_0}\right). \qquad (6).$$

Here, k_p denotes the "amplification" factor of the relay element, and $\delta(t)$ is the pulse function (Dirac function). Introducing (6) into (5), and using $L\left\{\delta\left(t - k\frac{\pi}{\omega_0}\right)\right\} = e^{-pk\frac{\pi}{\omega_0}}\xi\left(k\frac{\pi}{\omega_0}\right)$, (A), relation

Card 2/5 4

25710
S/020/61/139/003/009/025
B104/B201

Effect of random noise...

$$\Xi(p) = \Psi(p) - W(p)\frac{2k_p}{|\dot{\tilde{x}}(\pi/\omega_0)|}\Xi^*(p),$$ (7) is obtained, where

$\Xi(p) = L\{\xi(t)\}$, $\Psi(p) = L\{\psi(t)\}$ (B) and

$$\Xi^*(p) = D\left\{\xi\left(k\frac{\pi}{\omega_0}\right)\right\} = \sum_{k=-\infty}^{\infty} e^{-pk\frac{\pi}{\omega_0}}\,\xi\left(k\frac{\pi}{\omega_0}\right)$$ (C). Equation (7) corresponds to a pulse system consisting of a linear part with the transfer function W(p) and a pulse component with the amplification factor $2k_p/|\dot{\tilde{x}}(\pi/\omega_0)|$, and the input of which is feeded by a random noise.

$$\Xi^*(p) = \frac{\Psi^*(p)}{1 + \frac{2k_p}{|\dot{\tilde{x}}(\pi/\omega_0)|}W^*(p)} = K^*(p)\,\Psi^*(p),$$

(8) - (9) where

$$K^*(p) = \frac{1}{1 + \frac{2k_p}{|\dot{\tilde{x}}(\pi/\omega_0)|}W^*(p)}$$

Card 3/54

is then obtained, where $K^*(p)$ denotes the transfer function of the pulse element. Studying the action of the random noise upon the periodic operation leads to an analysis of a pulse system which is described by $\Xi^*(p)$. Relations

$$\overline{\xi^2\left(n\frac{\pi}{\omega_0}\right)} = \frac{1}{\pi}\int_0^{\pi} |K^*(j\omega)|^2 S_\varphi^*(\omega)\, d\omega \qquad (10)$$

or

$$\overline{\xi^2\left(n\frac{\pi}{\omega_0}\right)} = R_\xi(0) = \sum_{m=-\infty}^{\infty}\sum_{r=-\infty}^{\infty} k\left(m\frac{\pi}{\omega_0}\right) k\left(r\frac{\pi}{\omega_0}\right) R_\xi\left((m-r)\frac{\pi}{\omega_0}\right). \qquad (11)$$

are obtained for the mean square of deviation, where $S_\xi^*(\omega)$ and $R_\xi(n\frac{\pi}{\omega_0})$ denote the steady and spectral densities and the correlation function of random noise. There are 2 figures and 4 Soviet-bloc references.

ASSOCIATION: Institut avtomatiki i telemekhaniki Akademii nauk SSSR (Institute of Automation and Telemechanics, Academy of Sciences USSR)

S/020/61/139/004/008/025
B104/B231

44275

AUTHOR: Tsypkin, Ya. Z.

TITLE: Theory of automatic pulse systems with amplitude-pulse modulation of second kind

PERIODICAL: Akademiya nauk SSSR. Doklady, v. 139, no. 4, 1961, 834-837

TEXT: As is known, automatic pulse-amplitude systems can be divided into two classes. In systems of class I, a pulse train is represented as pulses of equal form whose height is determined by the modulating input quantity. The theory of this class is fairly well developed. Systems of class II may be considered continuous systems containing a discrete component in the circuit, which closes the circuit at the instants γT and opens it at the instants $(1-\gamma)T$ (Fig. 1). Accordingly, systems of class II have abruptly changing parameters corresponding to the parameters of the closed and the opened system. Here, the author shows a way of determining the equations of a system of class II. These equations are not algebraic but integral equations of the Fredholm type with a degenerate kernel. The solutions of these equations determine the image function of a discrete Laplace trans-

Card 1/5

formation, to which the results of the theory of systems of class I may directly be applied. It has been demonstrated by the author previously (Elektrosvyaz', no. 4, (1961)) that the equation of an open system of class II may be represented by a discrete Laplace transformation in the form

$$Z^{*}(q,\varepsilon)=\int_{0}^{1}W_{0}^{*}(q,\varepsilon-\lambda)\,X^{*}(q,\lambda)\,d\lambda, \qquad (1),$$

where

$$W_{0}^{*}(q,\varepsilon-\lambda)=\begin{cases}W^{*}(q,\varepsilon-\lambda), & \text{при } 0\leqslant\lambda\leqslant\varepsilon,\\ e^{-q}\,W^{*}(q,1+\varepsilon-\lambda) & \text{при } \varepsilon\leqslant\lambda\leqslant 1.\end{cases} \qquad (2).$$

The transmission function is equal to

$$W^{*}(q,\varepsilon)=\sum_{\nu=1}^{l}c_{\nu}\frac{e^{q}}{e^{q}-e^{q_{\nu}}}\,e^{q_{\nu}\varepsilon}; \qquad (3),$$

where q_ν indicates the poles of the transmission function $W(q)$ of the continuous component, $c'_\nu = \lim_{q \to q_\nu}(q-q_\nu)W(q)$ is a constant quantity, and $q = pT$ stands for a dimensionless parameter. For a closed system of class II, the condition for the discrete component may be written in the form $X^*(q,\varepsilon) = F^*(q,\varepsilon) - Z^*(q,\varepsilon)$ (4). Thus,

$$X^*(q, \varepsilon) = F^*(q, \varepsilon) - \int_0^\gamma W_0^*(q, \varepsilon - \lambda)\, X^*(q, \lambda)\, d\lambda. \qquad (5)$$

is obtained from (1) and (4) as an equation for a closed system of class II. This equation is represented in the form

$$X^*(q, \varepsilon) = F^*(q, \varepsilon) - \int_0^\varepsilon w(\varepsilon - \lambda)\, X^*(q, \lambda)\, d\lambda - \int_0^\gamma e^{-q} W^*(q, 1 + \varepsilon - \lambda)\, X^*(q, \lambda)\, d\lambda. \qquad (7).$$

Card 3/5

25848
S/020/61/139/004/008/025
B104/B231

(7) may be considered a combination between a convolution integral equation and a Fredholm integral equation on the condition that $0 \leqslant \varepsilon \leqslant \gamma$. By solving this equation as a convolution integral equation, an ordinary Fredholm integral equation is obtained, which may be represented in the form

$$X^*(q, \varepsilon) = F^*(q, \varepsilon) - \sum_{\mu=1}^{l} A_\mu e^{\bar{q}_\mu \varepsilon} \int_0^\varepsilon e^{-\bar{q}_\mu \lambda} F^*(q, \lambda)\, d\lambda - \sum_{\nu=1}^{l} \frac{c'_\nu e^{q_\nu}}{e^q - e^{q_\nu}} \sum_{\mu=1}^{l} \frac{A_\mu e^{\bar{q}_\mu \varepsilon}}{q_\nu - \bar{q}_\mu} \int_0^\gamma e^{-q_\nu \lambda} X^*(q, \lambda)\, d\lambda. \qquad (8);$$

This integral equation shows a degenerate kernel, and can be solved by known methods. It is shown that the expression obtained for the solution $X^*(q,\varepsilon)$ of a system of class II reduces the investigation of this system to the investigation of well-known systems of class I. There are 1 figure and 9 references: 5 Soviet-bloc and 4 non-Soviet-bloc.

ASSOCIATION: Institut avtomatiki i telemekhaniki Akademii nauk SSSR

Card 4/5

25848
S/020/61/139/004/008/025
B104/B231

Theory of automatic pulse systems ...

(Institute of Automation and Telemechanics of the Academy of Sciences USSR)

PRESENTED: January 26, 1961, by B. N. Petrov, Academician

SUBMITTED: January 24, 1961

Card 5/5

TSYPKIN, YA. Z.

BERG, A.I., glav. red.; TRAPEZNIKOV, V.A., glav. red.; BERKOVICH, D.M., zaml glav. red.; LERNER, A.Ya., doktor tekhn. nauk, prof., zam. glav. red.; AVEN, O.I., red.; AGEYKIN, D.I., red.; kand. tekhn. nauk, dots., red.; AYZERMAN, M.A., red.; VENIKOV, V.A., doktor tekhn. nauk, prof., red.; VORONOV, A.A., doktor tekhn. nauk, prof., red.; GAVRILOV, M.A., doktor tekhn. nauk, prof., red.; ZERNOV, D.V., red.; IL'IN, V.A., doktor tekhn. nauk, prof., red.; KITOV, A.I., kand. tekhn. nauk, red.; KOGAN, B.YA., doktor tekhn. nauk, red.; KOSTOUSOV, A.I., red.; KRINITSKIY. N.A., kand. fiz.-mat. nauk red.; LEVIN,G.A.,prof.red.; LOZINSKIY, M.G., doktor tekhn. nauk, red.: LOSSIYEVSKIY, V.L., red.; MAKSAREV, Yu.Ye., red.; MASLOV,A.A.,dots.,red.;POPKOV,A.A.,red.; RAKOVSKIY, M.Ye., red.; ROZENBERG, L.D., doktor tekhn.nauk, prof., red.; SOTSKOV, B.S., red.; TIMOFEYEV, P.V., red.; USHAKOV, V.B., doktor tekhn. nauk, red.; FEL'DBAUM, A.A., doktor tekhn. nauk, prof., red.; FROLOV, V.S., red.; KHARKEVICH, A.A., red.; KHRAMOY, A.V., kand. tekhn. nauk, red.; TSYPKIN, Ya.Z., doktor tekhn. nauk, prof., red.; CHELYUSTKIN, A.B., kand. tekhn. nauk, red.; SHREYDER, Yu.A., kand. fiz.-mat. nauk, dots., red.; BOCHAROVA, M.D., kand. tekhn.nauk, starshiy nauchnyy red.; DELONE, N.N., inzh., nauchnyy red.; BARANOV, V.I., nauchnyy red.; PAVLOVA, T.I., tekhn. red.

[Industrial electronics and automation of production processes]Avtomatizatsiia proizvodstva i promyshlennaia elektronika. Glav. red. A.I.Berg i V.A.Trapeznikov. Moskva, Gos.nauchn. izd-vo "Sovetskaia Entsiklopediia." Vol.1. A - I. 1962. 524 p.

KOGAN, B.Ya., kand. tekhn. nauk, otv. red.; KOTEL'NIKOV , V.A., kand. tekhn. nauk, red.; KHRAMOY, A.V., kand. tekhn.nauk, red.; TSYPKIN, Ya.Z., doktor tekhn. nauk, red.; SHILEYKO, A.V., inzh., red.; SHILEYKO, T.I., red. izd-va; MAKUNI, Ya.V., tekhn. red.

[Combined (analog - digital) computers]Kombinirovannye vychislitel'nye mashiny; trudy. Moskva, Izd-vo Akad.nauk SSSR, 1962. 294 p. (MIRA 16:4)

1. Vsesoyuznaya konferentsiya-seminar po teorii i metodam matematicheskogo modelirovaniya. 2d, Moscow, 1961. (Electronic computers)

TSYPKIN, Ya.Z., prof., doktor tekhn. nauk, otv. red.; GRIGOR'YEV, Ye.N., red. izd-va; DOROKHINA, I.N., tekhn. red.

[Automatic regulation and control] Avtomaticheskoe regulirovanie i upravlenie. Moskva, Izd-vo Akad.nauk SSSR, 1962. 526 p. (MIRA 15:4)

1. Akademiya nauk SSSR. Institut avtomatiki i telemekhaniki. (Automatic control)

TSYPKIN, Ya.Z. (Moskva)

Certain properties of pulse-type nonlinear automatic control systems with absolute stability. Avtom.i telem. 23 no.12:1565-1570 D '62. (MIRA 15:12)

(Automatic control)

TSYPKIN, Ya.Z.

Nonlinear pulse automatic systems and their stability in the large. Dokl.AN SSSR 145 no.1:52-55 Jl '62. (MIRA 15:7)

1. Institut avtomatiki i telemekhaniki Gosudarstvennogo komiteta po avtomatizatsii i mashinostroyeniyu pri Sovete Ministrov SSSR i Akademii nauk SSSR.

(Automatic control)

TSYPKIN, Ya. Z.*

"Fundamentals of Theory of Nonlinear Samples-Data Systems."

Paper to be presented at theIFAC Congress, to be hold in Basel, Switzerland, 27 Aug to 4 Sep 63.

* advance program gives initials as Ya. A.

BULGAKOV, A.A.; TSYPKIN, Ya.Z., doktor tekhn. nauk, prof., otv. red.; GRIGOR'YEV, Ye.N., red.izd-va; POLYAKOVA, T.V., tekhn. red.

[Principles of the dynamics of regulated rectifier systems] Osnovy dinamiki upravliaemykh ventil'nykh sistem. Moskva, Izd-vo Akad. nauk SSSR, 1963. 219 p. (MIRA 16:7)

(Electric current rectifiers)
(Electric current converters)

TSYPKIN, Ya.Z., prof., doktor tekhn. nauk; NAUMOV, B.N., kand. tekhn. nauk, dots., red.

[Lectures on the theory of automatic control; elements of the theory of sampled-data control] Lektsii po teorii avtomaticheskogo regulirovaniia; elementy teorii impul's-nogo regulirovaniia. Izd.3. Moskva, Vses. zaochnyi energ. in-t, 1963. 92 p. (MIRA 17:5)

AM4007933 BOOK EXPLOITATION S/

Tsy*pkin, Yakov Zalmanovich

Theory of linear pulse systems (Teoriya lineyny*kh impul'sny*kh sistem) Moscow, Fizmatgiz, 1963. 968 p. illus., biblio., index. 17,000 copies printed.

TOPIC TAGS: sample data system, closed loop sampling system, digital to analog conversion, analog to digital conversion, jw breakdown

PURPOSE AND COVERAGE: This book is intended for readers familiar with the fundamentals of pulse engineering and the theory of automatic control. It may also be useful to engineers and students taking advanced courses at schools of higher technical education. The book deals primarily with the general properties of closed and open linear pulse systems. The methods developed for investigating these properties are illustrated by numerous examples and detailed solutions of characteristic problems. This book is a revised and enlarged edition of the author's book "Theory of Pulse Systems," which was published in 1958. The general and uniform approach of

Card 1/2

AM4007933

the book makes it possible to carry out a full analysis and synthesis of linear pulse systems under various conditions of their operation. The author thanks L. S. Gold'farb, Professor (deceased); Ye. I. Dzhuri, Professor; K. Izava, Professor; V. Streyts, Doctor; G. P. Tartakovskiy, Professor; I. Chauner, Doctor; M. Shalomon, Professor; and L. N. Volgin, I. P. Devyaterikov, N. A. Korslev, P. V. Nadezhdin, and R. S. Rutman for their assistance.

TABLE OF CONTENTS:

Card 2/22

L 10380-63 EWT(d)/BDS—AFFTC/ASD/APGC—Pg-4/Pk-4/Pl-4/Po-4/Pq-4—
IJP(C)/BC
ACCESSION NR: AP3002616 S/0280/63/000/003/0121/0135

AUTHOR: Tsy*pkin, Ya. Z. (Moscow) 73

TITLE: On global stability of relay automatic systems 9

SOURCE: AN SSSR. Izv. Otd. tekh. nauk. Tekhnicheskaya kibernetika, no. 3, 1963, 121-135

TOPIC TAGS: relay automatic systems, asymptotic global stability criteria, global stability criteria, structure of stable systems

ABSTRACT: Global stability of relay automatic systems is studied on the basis of V. M. Popov's method applied to the study of absolute stability of continuous nonlinear systems and to a certain class of systems with discontinuous characteristics. For a closed relay automatic system consisting of a relay element and a linear part, a nonlinear integral equation of the Volterra type of the second kind is derived, and concepts of stability, asymptotic stability, and global stability are formulated. The upper bound of the solution of the Volterra-type integral equation is established, on the basis of which criteria

Card 1/2

L 10380-63
ACCESSION NR: AP3002616

for asymptotic global stability and global stability are derived in the form of Popov's theorem: a) If there exists such a positive number r, that for any real finite frequency Omega the inequality given in formula (1) of Enclosure holds, then the relay automatic system is globally asymptotically stable. b) For the relay automatic system to be globally stable, it is necessary that for every real finite frequency Omega, the inequality given in formula (2) of Enclosure holds. This theorem is shown to hold when the transfer function has a simple pole in the origin. Other forms of criteria are presented which make it possible to establish the global stability of a relay automatic system from its frequency or phase characteristics. From the global stability criteria established for relay automatic systems the necessary and sufficient conditions follow for their stability "in the small," derived earlier by various methods. Certain properties of transfer functions and frequency characteristics of stable relay automatic systems are established and used to determine the structure of globally stable relay automatic systems. It is noted that the global stability criteria derived are also valid for systems with delay and for systems with distributed parameters. The application of the criteria derived is illustrated by three examples. Orig. art. has: 68 formulas and 8 figures.

Card 2/2

TSYPKIN, Ya.Z. (Moskva)

Absolute stability of equilibrium position and processes in nonlinear sampled-data systems. Avtom. i telem. 24 no.12:1601-1615 D '63. (MIRA 17:1)

KHRAMOY, A.V. [deceased]; MEYEROV, M.V.; AYZERMAN, M.A.; ULANOV, G.M.; TSYPKIN, Ya.Z.; FEL'DBAUM, A.A.; LERNER, A.Ya.; PUGACHEV, V.S.; IL'IN, V.A.; GAVRILOV, M.A.

Work of the Institute of Automatic and Remote Control on the development of the theory of automatic control during 1939-1964. Avtom. i telem. 25 no. 6:763-807 Je '64.
(MIRA 17:7)

KULEBAKIN, V.S., akademik, otv. red.; PETROV, B.N., akademik, otv. red.; BODNER, V.A., doktor tekhn. nauk, red.; VORONOV, A.A., doktor tekhn. nauk, red.; IVAKHNENKO, A.G., red.; ISHLINSKIY, A.Yu., akademik, red.; KOSTYUK, O.M., kand. tekhn. nauk, red.; KRASSOV, I.M., kand. tekhn. nauk, red.; KUNTSEVICH, V.M., kand. tekhn. nauk, red.; KUKHTENKO,A.I., red.; RYABOV, B.A., doktor tekhn. nauk, red.; SIMONOV, N.I., doktor fiz.-mat. nauk, red.; ULANOV, G.M., doktor tekhn. nauk, red.; FEDOROV, S.M., kand. tekhn. nauk, red.; TSYPKIN, Ya.Z., doktor tekhn. nauk, red.; CHINAYEV, P.I., ~~kand. tekhn. nauk~~, red.; KRUTOVA, I.N., kand. tekhn. nauk, red.; RUTKOVSKIY, V.Yu., kand. tekhn. nauk, red.

[Invariancy theory in automatic control systems; transactions] Teoriia invariantnosti v sistemakh avtomaticheskogo upravleniia; trudy. Moskva, Nauka, 1964. 503 p. (MIRA 18:2)

1. Vsesoyuznoye soveshchaniye po teorii invariantnosti i yeye primeneniyu v avtomaticheskikh ustroystvakh. 2d, Kiev, 1962. 2. Chlen-korrespondent AN Ukr.SSR (for Ivakhnenko, Kukhtenko).

ACCESSION NR: AP4033351 S/0103/64/025/003/0281/0289

AUTHOR: Tsy*pkin, Ya. Z. (Moscow)

TITLE: Frequency criteria of the absolute stability of nonlinear sampled-data systems

SOURCE: Avtomatika i telemekhanika, v. 25, no. 3, 1964, 281-289

TOPIC TAGS: automatic control, sampled data control system, sampled data system stability, automatic control stability criterion, sampled data system absolute stability

ABSTRACT: A frequency criterion of the absolute stability of nonlinear automatic-control systems is proposed with stable, neutral, and unstable "reduced continuous parts" (RCP, see Fig. 1 of the enclosure). The criterion is, in fact, "a slight modification of the ordinary analog of the Nyquist and kindred criteria used for linear sampled-data systems." The system consists of a nonlinear element (NE) and a "linear sampling part" (LSP). The latter includes a sampling element (SE), which realizes the amplitude-pulse modulation, and RCP, which comprises a shaping unit (SU) and a continuous part (CP). The LSP can be

ACCESSION NR: AP4033351

characterized by a sampling characteristic w [n], a transfer function W* (q), or a frequency characteristic W* (jω). In addition to the stability criteria of linear systems, these formulas describe the sufficient conditions of absolute stability of nonlinear systems:

$$\mathrm{Re}\,\frac{W^*(j\bar{\omega})+\frac{1}{k}}{W^*(j\bar{\omega})+\frac{1}{r}}>0,\ \text{when}\ r>0 \quad \text{and} \quad \mathrm{Re}\,\frac{W^*(j\bar{\omega})+\frac{1}{k}}{W^*(j\bar{\omega})+\frac{1}{r}}<0,\ \text{when}\ r<0.$$

A connection is also established between the absolute stability of a nonlinear system and the stability margin of a linearized sampled-data system. Orig. art. has: 7 figures and 22 formulas.

ASSOCIATION: none

SUBMITTED: 22Aug63 ATD PRESS: 3070 ENCL: 01

SUB CODE: DP, IE NO REF SOV: 008 OTHER: 008

Card 2/3

ACCESSION NR: AP4033351

ENCLOSURE: 1

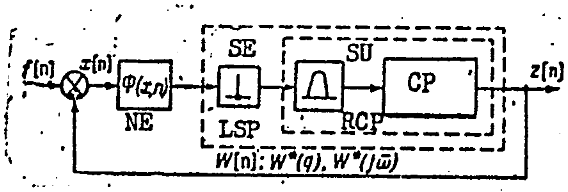


Fig. 1. Nonlinear sampled-data automatic system

Card 3/3

Card 2/2

ACCESSION NR: AP4042488 S/0103/64/025/007/1030/1036

AUTHOR: Tsy*pkin, Ya. Z. (Doctor of technical sciences) (Moscow)

TITLE: Absolute stability of one class of nonlinear sampled-data automatic systems

SOURCE: Avtomatika i telemekhanika, v. 25, no. 7, 1964, 1030-1036

TOPIC TAGS: automatic control, automatic control design, automatic control system, automatic control theory, sampled data system, nonlinear automatic control

ABSTRACT: In the author's earlier publications, a frequency criterion was formulated of the absolute stability of the equilibrium state in a sampled-data nonlinear automatic system, characteristics of whose nonlinear element belong with the sector (0, k). In the present article, the upper limit of k is elevated by (a) the introduction of a lower limit, $r > 0$, and (b) imposing constraints upon the derivative of the nonlinear-element characteristic. These techniques result not only in higher values of k but also in covering the cases of neutral and of unstable

ACCESSION NR: AP4042488

linear samplers. A simpler proof of the frequency criterion than that given by E. I. Jury, et al. (IEEE Trans., v. AC-9, no. 1, 1964) and by G. P. Scegö (Proc. Nat. Acad. Sci., v. 256, no. 49,,1963) is offered for the case $r = 0$. Conditions for the advantageous use of the new absolute-stability frequency criterion are indicated. Also, it is proven that, with the repetition period approaching zero, the new frequency criterion becomes identical with the well-known V. M. Popov condition of the absolute stability of a continuous nonlinear system. "The author wishes to thank F. R. Gantmakher for discussing the results, and also E. Jury, J. Pearson, and J. Gibson for discussing pertinent points and for their permission to peruse their manuscripts [5, 10]." Orig. art. has: 2 figures and 40 formulas.

ASSOCIATION: none

SUBMITTED: 18Oct63 ENCL: 00

SUB CODE: DP, IE NO REF SOV: 005 OTHER: 006

Card 2/2

Card 1/3

Card 3/3

BERG, A.I., glav. red.; TRAPEZNIKOV, V.A., glav. red.; TSYPKIN, Ya.Z., doktor tekhn. nauk, prof., red.; VORONOV A.A., prof., red.; AGEYKIN, D.I., doktor tekhn.nauk red.;GAVRILOV, M.A., red.; VENIKOV, V.A., doktor tekhn. nauk, prof., red.; SOTSKOV, B.S., red.; CHELYUSTKIN, A.B., doktor tekhn. nauk, red.; PROKOF'YEV, V.N., doktor tekhn. nauk, prof., red.; IL'IN, V.A., doktor tekhn. nauk, prof., red.; KITOV, A.I., doktor tekhn. nauk, red.; KRINITSKIY, N.A., kand. fiz.-mat. nauk, red.; KOGAN, B.Ya., doktor tekhn. nauk, red.; USHAKOV, V.B., doktor tekhn. nauk, red.; LERNER, A.Ya., doktor tekhn. nauk, prof., red.; FEL'DBAUM, A.A., doktor tekhn. nauk, prof., red.; SHREYDER, Yu.A., kand. fiz.-mat. nauk, red.; KHARKEVICH, A.A., akademik, red. [deceased]; TIMOFEYEV, P.V., red.; MASLOV, A.A., dots., red.; TRUTKO, A.F., inzh., red.; LEVIN, G.A., prof., red.; LOZINSKIY, M.G., doktor tekhn. nauk, red.; NETUSHIL, A.V., doktor tekhn. nauk, prof., red.; POPKOV, V.I., red.; ROZENBERG, L.D., doktor tekhn. nauk, prof., red.; LIFSHITS, A.L., kand. tekhn. nauk, red.; AVEN, O.I., kand. tekhn. nauk, red.; BLANN, O.M.[Blunn, O.M.], red.; BROYDA, V., inzh.,prof.,red.; BREKKL', L [Brockl,L.] inzh., knad. nauk, red.; VAYKHARDT, Kh. [Weichardt, H.], inzh., red.; BOCHAROVA,M.D., kand. tekhn. nauk, st. nauchn. red.

[Automation of production processes and industrial electronics] Avtomatizatsiia proizvodstva i promyshlennaia elektronika; entsiklopediia sovremennoi tekhniki. Moskva, Sovetskaia entsiklopediia. Vol.4. 1965. 543 p. (MIRA 18:6)

ACCESSION NR: AP4034027 S/0020/64/155/006/1272/1273

AUTHOR: Tsy*pkin, Ya. Z.

TITLE: Estimation of the degree of stability of nonlinear pulse systems

SOURCE: AN SSSR. Doklady*, v. 155, no. 6, 1964, 1272-1273

TOPIC TAGS: cybernetics, control theory, nonlinear pulse system, degree of stability, pulse system stability, pulser

ABSTRACT: In a previous work (Automatika i telemekhanika 24, #12, 1963; Teoriya lineyny*kh impul'sny*kh system, Moscow, 1963 - Theory of linear pulse systems) the author developed criteria for the stability of linear pulse systems. In the present work, he shows how the criteria for stability of nonlinear systems can be expressed in terms of criteria for the linearized systems. Orig. art. has: no figures, 11 eqs.

ASSOCIATION: Institut automatiki i telemekhaniki (Institute of Automation and Telemechanics)

Card 1/2

L 5145-66 EWT(1)/EWA(h)

ACC NR: AP5027887 SOURCE CODE: UR/0103/65/026/011/1947/1950

AUTHOR: Tsypkin, Ya. Z. (Moscow)

ORG: none

9
B

TITLE: On restoration of characteristics of a functional generator from randomly observed points

SOURCE: Avtomatika i telemekhanika, v. 26, no. 11, 1965, 1947-1950

TOPIC TAGS: functional generator, stochastic approximation theory, best approximation theory, potential function method

ABSTRACT: The problem of determining an unknown functional dependence (the characteristics of the functional generator)

$$y = f(x) \tag{1}$$

from a finite number of randomly observed values of the vector $x = (x_1, x_2, \ldots, x_n)$ and the corresponding values of y, which has been analyzed in detail by M. A. Ayzerman, E. M. Braverman, and L. I. Rozonoer (Avtomatika i telemekhanika, v. 25, no. 12, 1964, 1705-1714) by the method of potential functions is reconsidered in this article. It is shown that two of three algorithms for generating functional dependence (1) presented by M. A. Ayzerman and his co-workers can be obtained by applying

Card 1/2 UDC: 62-506.2

L 5145-66

ACC NR: AP5027887

0

the elementary concepts of the theory of the extremum of a function of several variables and the theory of stochastic approximations developed by H. Robbins and S. Monro (Ann. Math. Statistics, v. 22, no. 1, 1951). The problem of determining the characteristics of a nonlinear functional generator from random points is reduced to the problem of the best approximation of the function f(x) by a function

$$\hat{f}(x)=\sum_{\nu=1}^{N} c_\nu \varphi_\nu(x) \quad (2)$$

where $\varphi_\nu(x)$ are linearly independent functions and C_ν are unknown coefficients, that is, it consists in determining C_ν, values such that the functional describing the measure of the deviation $\hat{f}(x)$ from f(x) (the mathematical expectation of a certain convex function $F(f(x) - \hat{f}(x))$ is minimized. To determine C_ν, a system of nonlinear equations is derived which is solved by applying the method of stochastic approximations. The recurrence relation (the algorithm) for determining the C_ν is derived whose form depends on the selection of the function $F(f(x) - \hat{f}(x))$. It is shown that somewhat different algorithms can be obtained by using the generalized method of statistical approximation developed by J. Krefer and J. Wolfowitz (Ann. Math. Statistics, v. 23, no. 3, 1952). It is stressed that derived algorithms can be applied to certain pattern recognition problems. Orig. art. has: 16 formulas. [LK]

SUB CODE: MA/ SUBM DATE: 10May65/ ORIG REF: 002/ OTH REF: 004/ ATD PRESS: 4133

Card 2/2 ms

L 7761-66 EWT(d)/EWP(v)/EWP(k)/EWP(h)/EWP(l)

ACC NR: AP5027832 SOURCE CODE: UR/0020/65/165/001/0051/0054

36

B

AUTHOR: Tsypkin, Ya. Z.; Epel'man, M. S.

ORG: Institute of Automation and Telemechanics, AN SSSR (Institut avtomatiki i telemekhaniki, AN SSSR)

TITLE: The criterion of absolute stability of a multiconnected pulse system with nonstationary characteristics of nonlinear elements

SOURCE: AN SSSR. Doklady, v. 165, no. 1, 1965, 51-54

TOPIC TAGS: nonlinear control system, control system stability, automatic control theory

14

ABSTRACT: A multiconnected pulse system containing a complex linear continuous section (LCS), M pulse elements (PE) operating in synphase, and M nonlinear elements (NE) the characteristics of which may in general depend on time, may be represented in the form of the vector block scheme shown in Fig. 1.

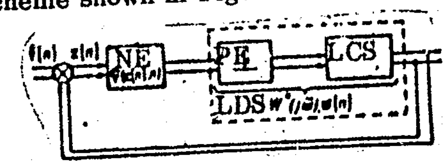


Fig. 1 Vector block scheme of a multiconnected pulse system

UDC: 519.95

2

Card 1/2